Re: Phase frequency detector

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2004−06/0654.html

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From: Bill Sloman (*bill.sloman_at_ieee.org*)
Date: 06/07/04

Date: 7 Jun 2004 09:23:38 −0700

mrmonett@yahoo.com (Mike Monett) wrote in message
news:<7e4a2a11.0406061856.18bc7714@posting.google.com>...
> *Winfield Hill <Winfield_member@newsguy.com> wrote in message*
news:<c973ke0n35@drn.newsguy.com>...
> > *Bill Sloman wrote...*
> > >
> > > *Mike Monett wrote ...*
> > >>
> > >> *Another possible confusion is shown in the datasheet for the Philips*
> > >> *HCT9046A chip:*
> > >>
> > >> *http://www.philipslogic.com/products/hc/pdf/74hct9046a.pdf*
> > >>
> > >> *On page 6, they claim that feeding a capacitor with a current source*
> > >> *eliminates the deadband in the phase detector. They show the*
> > >> *resulting performance in Fig. 11 on page 11.*
> > >>
> > >> *The truth is the cmos current sources still have a turnon and*
> > >> *turnoff delay. If they are faster than the reset pulse from the pfd,*
> > >> *there will be no deadband. But just because it is a current source*
> > >> *feeding a cap does not guarantee this will be true. The prop delay*
> > >> *of the phase detector has to be taken into account.*
> > >>
> > >> *So if the ic manufacturers can't get it right, it looks like the*
> > >> *confusion over the deadband problem will continue as a topic in the*
> > >> *newsgroup.*
> > >
> > > *You should have read a bit more of the Philips data sheet. Their*
> > > *trick, as detailed on page 8 of the application note, very*
> > > *specifically in the note on Fig.8 at the bottom of the page, is that*
> > > *the postive and negative current sources are overlapped by about*
> > > *15nsec, and their actual claim is that feeding a capacitor with their*
> > > *pair of overlapped current sources eliminates the deadband, which does*
> > > *sound consistent with your story.*
> > >
> > > *Are you really claiming that Philips didn't got it right on the basis*
> > > *of an over−hasty glance at their data sheet? Or do you have more*
> > > *persuasive evidence, like some measurements on the 9046 in action?*

> > >
> > > *According to Tom Bruhns, Agilent list the 74HCT9046 as one of their*
> > > *approved parts, so it seems likely that it does what Philips claim.*
> >
> > *Mike, I agree with Bill. After some thought, do you as well?*
> >
> > *Thanks,*
> > *− Win*
> >
> > *(email: use hill_at_rowland−dot−org for now)*
>
>
> *Win, Bill,*
>
> *Thanks for your posts. Sorry for the delay − Google news was down*
> *recently but may be OK now.*
>
> *Don't get me wrong − I'm not claiming the Philips part doesn't work.*
> *But the datasheet does not offer a way to prove it.*
>
> *Most large companies require a comprehensive incoming test procedure*
> *when qualifying a part to ensure it meets requirements. But the key*
> *parameters that guarantee zero deadband are not specified in the*
> *datasheet, and Philips offers no tests to confirm it.*
>
> *The "about 15nS" overlap is hardly a specification, and the*
> *datasheet does not attempt to measure it. We might like to assume*
> *the risetimes of the current pumps would be faster than the overlap*
> *time, but these are not specified or measured.*
>
> *One could construct a special test fixture to measure the phase*
> *detector transfer curve and ensure it is linear through zero. But*
> *the test is slow and costly, fairly difficult to implement, and does*
> *not tell how close the chip is to failure.*
>
> *What is needed is a way to measure the overlap time and compare it*
> *to the current pump risetimes. If the risetimes are faster than the*
> *overlap time, the phase detector will be linear through zero. The*
> *difference between these two parameters tells how much margin is*
> *available before failure.*
>
> *It turns out there might be a way to get the needed information.*

<snip>

Philips almost certainly has the necessary information, but the details of the performance of the transistors and interconnections in whatever fabrication process they are using at the moment to make the 9046 is the kind of proprietary information that they are not likely to release. As far as I know, most IC manufacturers have extensive and reliable simulation packages for their integrated circuit processes,

validated by detailed measurements on simple test circuits, and
probably by point measurements within more complicated circuits.

When I worked at Cambridge Instruments − 1982−1991 − I did a lot of
work on a couple of specialised stroboscopic electron microscopes
intended for making just this sort of measurement on unencapsulated
integrated circuits, in competition with the mechanical probes long
used to to the same sort of work.

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Bill Sloman, Nijmegen